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Search Results - Record(s) 1 through 24 of 24 returned.

 1. Document ID: US 5780793 A

L1: Entry 1 of 24

File: USPT

Jul 14, 1998

US-PAT-NO: 5780793
DOCUMENT-IDENTIFIER: US 5780793 A

TITLE: Safety switch having a carbon fiber conductor

DATE-ISSUED: July 14, 1998

✓

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Buchholz; Hans-Volker	Hildesheim			DE
Opitz; Wolfgang	Bockenem			DE

US-CL-CURRENT: 200/61.44; 200/262, 200/61.43

ABSTRACT:

A safety switch (1) has a support (2) of an elastomer and a through-going cavity (3). Within the cavity (3) are arranged electrical conductors (4) and (5) which in a rest condition are arranged at a distance (9) from one another. The electrical conductors (4, 5) are each formed as a strip of carbon fibers and have one broad side (6) and (7) vulcanized to the support (2) either directly or by way of a coupling layer (8). Substantially perpendicular pressure (12, 13) on the safety switch (1) leads to the deformation of the support (2) and eventually to the contact of the electrical conductors (4, 5) with each other. By this means, safety functions are controlled.

20 Claims, 9 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 2

[Full](#) | [Title](#) | [Citation](#) | [Prior](#) | [Reexam](#) | [Classification](#) | [Date](#) | [Reference](#) | [Sequences](#) | [Attachments](#) | [Claims](#) | [PAC](#) | [Drawings](#) | [Image](#) 2. Document ID: US 5420465 A

L1: Entry 2 of 24

File: USPT

Jul 30, 1995

✓

US-PAT-NO: 5420465
DOCUMENT-IDENTIFIER: US 5420465 A

TITLE: Switches and sensors utilizing pultrusion contacts

DATE-ISSUED: May 30, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wallace; Stanley J.	Victor	NY		
Courtney; John E.	Macedon	NY		
Peck; Wilbur M.	Rochester	NY		
Swift; Joseph A.	Ontario	NY		

US-CL-CURRENT: 307/116, 361/214

ABSTRACT:

Electronic switches and sensors have pultruded contact members. A switch includes first and second contact members, at least one of which including a pultruded contact member having an insulating body and a plurality of conductive fibers carried within the insulating body. The pultruded contact member is fibrillated at least at one end thereof to expose the conductive fibers for establishing electrical contact when brought into physical contact with the other of the first and second contact members. A sensor for detecting the presence of an article in a detection zone includes a contact at one side of the detection zone, and a pultrusion including a plurality of electrically conductive fibers and a host material carrying the plurality of fibers, supported at another end of the detection zone. One end of the pultrusion has a fibrillated end portion extending across the detection zone in electrical connection with the contact that is displaced by the article when the article is present in the detection zone to disconnect the electrical connection. The sensor is particularly well adapted to sense a sheet of paper or the like, for example, in an electrostaticographic reproducing machine, and can be connected to a source of electrical potential so that the conductive fibers serve to discharge any static charges existing on the sheet of paper.

36 Claims, 15 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 5

[Full](#) | [Title](#) | [Claims](#) | [Front](#) | [Back](#) | [Classification](#) | [Date](#) | [References](#) | [Sequences](#) | [Attachments](#)[PATIC](#) | [Drawn Dept](#) | [Image](#) 3. Document ID: US 5282310 A

L1: Entry 3 of 24

File: USPT

Feb 1, 1994

US-PAT-NO: 5282310

DOCUMENT-IDENTIFIER: US 5282310 A

TITLE: Method for manufacturing a fibrillated pultruded electronic component

DATE-ISSUED: February 1, 1994

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Rommelmann; Heiko	Webster	NY		
Thompson; Allen J.	Akron	NY		

US-CL-CURRENT: 29/825, 200/262, 264/263, 29/419.1, 29/826

ABSTRACT:

A method for manufacturing a fibrillated pultruded electronic component includes the steps of providing a rod comprising a plurality of conductive fibers embedded in a

matrix material, the rod having a first end and a second end. The rod is rotated and a liquid is sprayed onto the rod at a distance from the first end of the rod. The matrix material is abraded away from between the fibers of the rod. The fibers of the rod are then cut. A disk is formed which has a plurality of conductive fibers embedded in a matrix material. However, the ends of the disk include only the conductive fibers and not the matrix material. This enables the ends of the disk to have a fibrillated brush-like structure which is particularly well suited for low energy electronic/microelectronic signal level circuitry typified by contemporary digital and analog signal processors.

14 Claims, 8 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 4

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Sequences](#) | [Attachments](#)

[PDF](#) | [Drawings](#) | [Image](#)

4. Document ID: US 5270106 A

L1: Entry 4 of 24

File: USPT

Dec 14, 1993

US-PAT-NO: 5270106

DOCUMENT-IDENTIFIER: US 5270106 A

TITLE: Fibrillated pultruded electronic component

DATE-ISSUED: December 14, 1993



INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Orlowski; Thomas E.	Fairport	NY		
Swift; Joseph A.	Ontario	NY		
Wallace; Stanley J.	Victor	NY		
Peck; Wilbur M.	Rochester	NY		
Courtney; John E.	Macedon	NY		
Rollins; David E.	Lyons	NY		

US-CL-CURRENT: 428/299.1, 174/126.2, 200/262, 200/265, 219/121.65, 361/220, 361/221,
361/222, 399/168, 428/338, 428/408, 428/902

ABSTRACT:

An electronic component for making electrical contact with another component comprising a nonmetallic pultruded composite member having a plurality of small generally circular cross section conductive fibers in a polymer matrix the plurality of fibers being oriented in the matrix in a direction substantially parallel to the axial direction of the member and being continuous from one end of the member to the other to provide a plurality of electrical point contacts at each end of the member at least one end of the member having a fibrillated brush-like structure of said plurality of fibers providing a densely distributed filament contact wherein the terminating ends of the fibers in the brush-like structure defines an electrically contacting surface. In a preferred embodiment the brush-like member is a laser fibrillated structure.

38 Claims, 10 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 3

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5. Document ID: US 5155306 A

L1: Entry 5 of 24

File: USPT

Oct 13, 1992

US-PAT-NO: 5155306

DOCUMENT-IDENTIFIER: US 5155306 A

TITLE: Switch substrate and method of manufacture

DATE-ISSUED: October 13, 1992

INVENTOR-INFORMATION:

NAME

Iijima; Shunichi
Takemura; Masanori

CITY

Suwa
Suwa

STATE

JP
JP

ZIP CODE

COUNTRY
JP
JPUS-CL-CURRENT: 200/11DA; 174/260; 200/11G; 200/292

ABSTRACT:

A switch substrate for a switching device that includes an electrical contact brush, the substrate formed with alternating conductive and insulating portions on its surface and having a groove formed between the conductive and insulating portions to eliminate insulating abrasion powder from the surface of the contact brush. The top of the conducting portions is higher than the bottom of the groove but can be above or below the surface of the insulating portions. To form such a substrate, a conductive layer having projections is formed and is engaged with a mold so that the projections are compressed. After the substrate is removed from the mold, the compressed projections extend to their actual height.

19 Claims, 18 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 7

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6. Document ID: US 5139862 A

L1: Entry 6 of 24

File: USPT

Aug 18, 1992

US-PAT-NO: 5139862

DOCUMENT-IDENTIFIER: US 5139862 A

TITLE: Pultruded electronic device

DATE-ISSUED: August 18, 1992

INVENTOR-INFORMATION:

NAME

Swift; Joseph A.

Wallace; Stanley J.

Peck; Wilbur M.

CITY

Ontario

Victor

Rochester

STATE

NY

NY

NY

COUNTRY

US-CL-CURRENT: 428/299.1, 156/180, 156/47, 174/126.2, 200/262, 200/265, 264/171.24,
264/210.1, 271/258.01, 271/265.01, 310/249, 310/251, 310/253, 338/214, 338/66,
361/220, 361/222, 428/338, 428/408

ABSTRACT:

An electronic device for conducting electric current has two contacting components at least one of which is a nonmetallic electronic contact in the form of a pultruded composite member made of a plurality of small generally circular cross section conductive fibers in a polymer matrix, the fibers being oriented in the matrix in a direction substantially parallel to the axial direction of the pultruded composite member and being continuous from one end of the member to the other to provide a plurality of electrical point contacts at each end of the member.

46 Claims, 10 Drawing figures

Exemplary Claim Number: 1,25

Number of Drawing Sheets: 6

[Full](#) | [Title](#) | [Claims](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [References](#) | [Sequences](#) | [Attachments](#)

[DOC](#) | [Print Page](#) | [Message](#)

7. Document ID: US 5117529 A

L1: Entry 7 of 24

File: USPT

 Jun 2, 1992

US-PAT-NO: 5117529

DOCUMENT-IDENTIFIER: US 5117529 A

TITLE: Combination roller and combination painting method using the combination roller

DATE-ISSUED: June 2, 1992

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ohta; Tanetugu	Yamanashi			JP

US-CL-CURRENT: 15/230.11, 15/230.16, 15/235, 492/24

ABSTRACT:

An elastic sheet having many kinds of shapes is secured upon the surface of a roller so as to form a combination roller which can create a painted pattern when the roller is rotated such that the paint is thrown onto a surface to be painted by means of centrifugal force whereby the spray splashed thereby creates a pattern. A pattern having different thicknesses of paints and widths of lines can thus be created as a unit of a predetermined repetitive pattern.

20 Claims, 21 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 5

[Full](#) | [Title](#) | [Claims](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [References](#) | [Sequences](#) | [Attachments](#)

[DOC](#) | [Print Page](#) | [Message](#)

8. Document ID: US 5111178 A

L1: Entry 8 of 24

File: USPT

May 5, 1992

US-PAT-NO: 5111178

DOCUMENT-IDENTIFIER: US 5111178 A

TITLE: Electrically conductive polymer thick film of improved wear characteristics and extended life

DATE-ISSUED: May 5, 1992

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Bosze, Wayne P.	Riverside	CA		

US-CL-CURRENT: 338/160; 338/226, 338/310

ABSTRACT:

An electrically conductive polymer film composition includes a polymeric resin, an electrically conductive substance intimately mixed in sufficient quantity with the polymeric resin to render the polymeric resin electrically conductive, and particles, such as fibers or spheres of appropriate size, admixed with the polymer composition in sufficient quantity so that in the cured polymer film the particles protrude from the surface of the film and render the surface uneven on a micro scale. The cured polymer film composition of the invention is incorporated in potentiometers and similar electric and electronic devices as a thick film where a contact wiper rides substantially continuously in contact with the protruding fibers.

34 Claims, 5 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 2

[File](#) [Title](#) [Citation](#) [Print](#) [Review](#) [Classification](#) [Date](#) [References](#) [Sequenced](#) [Attachments](#)[338C](#) [Draw Desc](#) [Image](#) 9. Document ID: US 5072080 A

L1: Entry 9 of 24

File: USPT

Dec 10, 1991

US-PAT-NO: 5072080

DOCUMENT-IDENTIFIER: US 5072080 A

TITLE: Safety edge switch

DATE-ISSUED: December 10, 1991

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Beckhausen; Karlheinz	D-5000 Cologne 41			DE

US-CL-CURRENT: 200/61.43

ABSTRACT:

Safety edge switch for power-actuated devices such as roller gates, roller grilles,

lifting platforms and working platforms as well as for securing movable objects and machines having a hollow elastic profile, which exhibits, at least on its inner side, surfaces that are electrically conductive by virtue of admixtures of conductive substances, such as carbon black, graphite and metal powder, mutual contact of the electrically conductive surfaces leading to a switching pulse. The hollow body exhibits in the interior at least two strip-like, electrically conductive projections and at least one opposing surface, likewise electrically conductive, guided along the hollow body, by which means contacting between the electrically conductive surfaces is improved. The use of multiple electrically conductive projections insures adequate electrical contact between the conductive projections and the opposed conductive surface even when the operating force is applied from various directions.

12 Claims, 9 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 5

[Full](#) | [Title](#) | [Caption](#) | [Front](#) | [Back](#) | [Classification](#) | [Date](#) | [Reference](#) | [Supplements](#) | [Attachments](#)

[DOC](#) | [Draw Back](#) | [Image](#)

10. Document ID: US 5023418 A

LL: Entry 10 of 24

File: USPT

Jun 11, 1991

US-PAT-NO: 5023418

DOCUMENT-IDENTIFIER: US 5023418 A

✓

TITLE: Safety edge switch

DATE-ISSUED: June 11, 1991

INVENTOR- INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Beckhausen; Karlheinz	D-5000 Cologne 41			DE

US-CL-CURRENT: 200/511; 187/317, 200/61.43, 49/26

ABSTRACT:

A safety edge switch for power-actuated devices such as roller gates, roller grilles, etc., and lifting platforms, working platforms and the like, as well as for the guarding of machines or spaces, for example as safety flooring, with a hollow rubber profile (1) within which there is a knife-edge rib (5), the surface of the rib and the opposing surface of the hollow rubber profile being made electrically conductive and the mutual contact of the surfaces leading to a switching pulse. The requisite conductivity of the hollow rubber profile is achieved by virtue of the fact that the rib (5) and the main part of the hollow rubber profile (1) are made wholly electrically conductive, the conductivity arising through the admixture of conductive substances such as carbon black, graphite, metal powder and the like. The rib and the main part of the hollow rubber profile are insulated from each other by virtue of the fact that ordinary nonconductive rubber is present between these parts. The conductivity in the rib of the main part of the hollow rubber profile (1) can be enhanced by means of electrically conductive wires (6) of metal, carbon fibers or graphite fibers and the like.

17 Claims, 5 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 5

[Full](#) | [Title](#) | [Caption](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [References](#) | [Sequences](#) | [Attachments](#)[HTML](#) | [Print Data](#) | [Image](#)**□ 11. Document ID: US 5003693 A**

L1: Entry 11 of 24

File: USPT

Apr 2, 1991

US-PAT-NO: 5003693

DOCUMENT-IDENTIFIER: US 5003693 A

TITLE: Manufacture of electrical circuits

DATE-ISSUED: April 2, 1991

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Atkinson; Anthony	Gateshead			GB2
Gray; Richard	South Shields			GB2
Denes; Oscar L.	Greendale	WI		

US-CL-CURRENT: 29/849

✓

ABSTRACT:

A method of providing an electrical circuit wherein a carrier, which is a film of insulating plastic material with a circuit pattern thereon is supported in a mould and a moulding material is applied by the application of heat and pressure to provide a substrate so that the circuit is embedded in or within a three-dimensional surface of the moulded substrate.

20 Claims, 13 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 3

[Full](#) | [Title](#) | [Caption](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [References](#) | [Sequences](#) | [Attachments](#)[HTML](#) | [Print Data](#) | [Image](#)**□ 12. Document ID: US 4970553 A**

L1: Entry 12 of 24

File: USPT

Nov 13, 1990

US-PAT-NO: 4970553

DOCUMENT-IDENTIFIER: US 4970553 A

✓

TITLE: Electrical component with conductive path

DATE-ISSUED: November 13, 1990

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Orlowski; Thomas E.	Fairport	NY		
Swift; Joseph A.	Ontario	NY		

US-CL-CURRENT: 399/90, 174/258, 219/121.65, 219/121.66, 219/121.85

ABSTRACT:

A three dimensional electrical component having a first side and a second side formed from an electrically insulating polymer matrix capable of heat conversion to an electrically conducting polymer matrix has at least one passageway from the first side to the second side having a tapered wall slope configuration from the first side to the second side with constantly changing cross section of the passageway from the first side through the passageway to the second side, an electrically conducting path between the first side and the second side formed by the in situ heat conversion of the walls of the passageway in the electrically insulating polymer matrix. In a preferred embodiment the electrically conducting path is formed by directing a laser beam to the walls of the passageway to heat the insulating polymer matrix to a temperature sufficient to convert it to an electrically conducting polymer matrix.

46 Claims, 14 Drawing figures
Exemplary Claim Number: 1,18,32
Number of Drawing Sheets: 5

[Full](#) | [Title](#) | [Caption](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [References](#) | [Sequence](#) | [Attachments](#)

[RDMC](#) | [Draw Data](#) | [Image](#)

□ 13. Document ID: US 4967314 A

L1: Entry 13 of 24

File: USPT

Oct 30, 1990

US-PAT-NO: 4967314
DOCUMENT-IDENTIFIER: US 4967314 A

TITLE: Circuit board construction

DATE-ISSUED: October 30, 1990

✓

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Higgins, III; Leo M.	Lakeville	MA		

US-CL-CURRENT: 361/792; 174/261, 361/778

ABSTRACT:

A high density multi-level printed wiring board having inter-level electrical connections made by via interconnect holes which are drilled or punched through only those layers of the wiring board that separate the two layers containing the conductors which are to be connected and said holes being filled with a low-resistance silver-filled conductive epoxy.

8 Claims, 5 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 2

[Full](#) | [Title](#) | [Caption](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [References](#) | [Sequence](#) | [Attachments](#)

[RDMC](#) | [Draw Data](#) | [Image](#)

□ 14. Document ID: US 4912288 A

L1: Entry 14 of 24

File: USPT

Mar 27, 1990

✓

US-PAT-NO: 4912288
DOCUMENT-IDENTIFIER: US 4912288 A

TITLE: Moulded electric circuit package

DATE-ISSUED: March 27, 1990

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Atkinson; Anthony	Tyne & Wear			GB2
Gray; Richard	Tyne & Wear			GB2
Denes; Oscar L.	Greendale	WI		

US-CL-CURRENT: 174/251; 361/792

ABSTRACT:

A method of providing an electrical circuit wherein a carrier, which is a film of insulating plastic material with a circuit pattern thereon is supported in a mould and a moulding material is applied by the application of heat and pressure to provide a substrate so that the circuit is embedded in or within a three-dimensional surface of the moulded substrate.

9 Claims, 15 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 4

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 15. Document ID: US 4894500 A

L1: Entry 15 of 24

File: USPT

Jan 16, 1990

US-PAT-NO: 4894500
DOCUMENT-IDENTIFIER: US 4894500 A

TITLE: Rotary selector switch

DATE-ISSUED: January 16, 1990



INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Yamazaki; Atsuo	Iruma			JP
Kaba; Toshiaki	Iruma			JP
Sakaguchi; Kenji	Hanno			JP

US-CL-CURRENT: 200/565; 200/308, 200/571

ABSTRACT:

A rotary selector switch having a wiper which is arranged on a rotor rotatably held in a cavity formed by a housing and case and is slidingly rotated on the housing base on which are disposed fixed contact elements, thereby to connect electrically at least one of the fixed contact elements to one of the remaining fixed contact elements, in which vertical walls of dovetail portions constituting a ridge

projecting from the rotor base are arranged to abut in turn against side walls of ridges extended from an annular ledge arranged at an inner side of the housing corresponding to the rotation of the rotor whereby the rotation of the rotor is stopped; a slot defined in one of the dovetail portions of the ridge arranged on the rotor base is engaged in turn with one of the projections arranged on the housing base corresponding to the rotation of the rotor whereby an audible click may be caught; a slit defined in the housing base between the fixed contact elements disposed thereon aids to cut off a chain of undesirable powder bridging the fixed contact elements one of which is electrically connected to one of the remaining contact elements via the wiper.

2 Claims, 18 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 6

[Full](#) | [Title](#) | [Caption](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Searches](#) | [Attachments](#)

[SAC](#) | [Draw Sheets](#) | [Image](#)

16. Document ID: US 4732802 A

L1: Entry 16 of 24

File: USPT

Mar 22, 1988

US-PAT-NO: 4732802

DOCUMENT-IDENTIFIER: US 4732802 A

TITLE: Cermet resistive element for variable resistor

DATE-ISSUED: March 22, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Bosze, Wayne P.	Riverside	CA		
Froebe, Ronald L.	Rubidoux	CA		
McClure, Gordon	Pasadena	CA		
Thomas, Jr., Ronald E.	Alta Loma	CA		
Weingartner, Philip F.	Alta Loma	CA		



US-CL-CURRENT: 428/210, 338/171, 338/312, 428/432, 428/901

ABSTRACT:

An improved resistive element comprises a film-type resistive layer applied to an insulative substrate and then fired. An array of discrete, spaced apart islands of predominantly conductive material is then applied to the resistive layer in a repetitive pattern having predetermined inter-island spacing. The islands have a conductivity that is substantially greater than the conductivity of the resistive layer. Preferably, the islands are of substantially uniform shape and size. In one preferred embodiment, the islands are formed of a conductive thick film ink that is screen-printed onto a cermet resistive layer through an appropriate mask, and then fired. In another preferred embodiment, the islands are formed of a conductive metal that is applied to the resistive layer by vapor deposition, sputtering, or ion implantation through suitable mask. Either embodiment of the invention provides a resistive element with lower contact resistance and improved contact resistance stability than prior art film-type resistive elements, while maintaining good linearity, setability, and resolution.

32 Claims, 4 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 1

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Sequence](#) | [Attachments](#)[PDF](#) | [Print](#) | [Image](#)**□ 17. Document ID: US 4728755 A**

L1: Entry 17 of 24

File: USPT

Mar 1, 1988

US-PAT-NO: 4728755

DOCUMENT-IDENTIFIER: US 4728755 A

TITLE: Rotary switch construction and method of making the same

DATE-ISSUED: March 1, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Fowler, Daniel L.	Kentwood	MI		
Froeb, John W.	Riverside	IL		

US-CL-CURRENT: 200/11DA; 200/292, 29/622

ABSTRACT:

A rotary switch construction and method of making the same are provided, the switch construction comprising a surface unit having a substantially circular electrically conductive code pattern thereon, an electrically conductive wiper contact unit cooperating with the surface unit for making contact with a selected part of the pattern, and a rotary selector operatively associated with the units for selecting the desired part of the pattern that is to be contacted by the wiper contact unit, the wiper contact unit comprising a first pair of electrically connected wiper contacts disposed to respectively contact the pattern on a first substantially circular path thereof at points thereon that are disposed approximately 180.degree. from each other.

16 Claims, 14 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 6

[Full](#) | [Title](#) | [Citation](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [Reference](#) | [Sequence](#) | [Attachments](#)[PDF](#) | [Print](#) | [Image](#)**□ 18. Document ID: US 4694272 A**

L1: Entry 18 of 24

File: USPT

Sep 15, 1987

US-PAT-NO: 4694272

DOCUMENT-IDENTIFIER: US 4694272 A

TITLE: Electric potentiometer

DATE-ISSUED: September 15, 1987

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Maisch; Wolfgang	Schwieberdingen			DE

US-CL-CURRENT: 338/138; 338/142; 338/162; 338/171

ABSTRACT:

An electric potentiometer including a wiper lever having brush wipers, which upon a rotational movement about a pivot shaft sweep over electrically conductive layers applied to a carrier plate. A resistor layer is joined at one end to a connection layer and at the other to a grounded connection layer. The layer is joined at one end to a pickup connection layer and at the other, via a supplementary layer resistor, to the connection layer. A sliding layer of electrically non-conductive paste material is disposed between the carrier plate and the resistor layer, the latter of which is formed from a paste material provided with carbon particles. The sliding layer is wider than the width of the wiper and the resistor layer.

3 Claims, 2 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 1

[Full](#) | [Title](#) | [Claims](#) | [First](#) | [Review](#) | [Classification](#) | [Facts](#) | [Preferences](#) | [Responses](#) | [Attachments](#)

[KIND](#) | [Claim Data](#) | [Image](#)

19. Document ID: US 4641949 A

LI: Entry 19 of 24

File: USPT

Feb 10, 1987

US-PAT-NO: 4641949

DOCUMENT-IDENTIFIER: US 4641949 A

TITLE: Conductive brush paper position sensor

DATE-ISSUED: February 10, 1987

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wallace; Stanley J.	Victor	NY		
Jedlicka; Josef E.	Rochester	NY		
Peck, Jr.; Wilbur M.	Rochester	NY		

US-CL-CURRENT: 399/390; 271/258.01; 399/389

ABSTRACT:

The present invention is concerned with a switching element comprised of oppositely disposed conductive fiber brushes and/or brush-like elements for detecting the presence or absence of paper at various locations in a xerographic copy machine. The oppositely disposed brushes are made from poly-acrylo-nitrile, a carbon based polymer material, which can be fabricated with relatively low values of resistance. Typical fiber bundles may consist of 6000 individual fibers each of 6-10 microns in diameter. In operation each individual conductive fiber acts as a separate electrical path through which the external circuit is completed. Passage of paper through the "nip" of the fiber to fiber electrical contact opens the circuit which is easily detected through associated circuitry which indicates the presence of paper. Likewise, arrays incorporating multiple such sensor switches may be fabricated for the purpose of indicating the size of the document interrupting specific low resistance fiber-fiber switches.

4 Claims, 6 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 3

[Full](#) | [Title](#) | [Claims](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [References](#) | [Sequence](#) | [Attachments](#) | [XREF](#) | [Drawings](#) | [Image](#)

20. Document ID: US 4415635 A

L1: Entry 20 of 24

File: USPT

Nov 15, 1983

US-PAT-NO: 4415635
DOCUMENT-IDENTIFIER: US 4415635 A

TITLE: Electric brush

DATE-ISSUED: November 15, 1983

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wilsdorf; Doris	Charlottesville	VA		
Wilsdorf; Heinz G. F.	Charlottesville	VA		
Adkins, III; Charles M.	Charlottesville	VA		

US-CL-CURRENT: 428/611; 310/248, 310/252, 428/607, 428/614, 428/651, 428/652, 428/653, 428/656, 428/661, 428/670, 428/671, 428/673, 428/674, 428/675, 428/677, 505/812, 505/877

ABSTRACT:

A multifiber electrical brush formed of an electrically conductive matrix material having plural electrically conducting fiber wires embedded therein and extending therefrom, wherein the fiber wires have a diameter varying from 1 to 120.mu.m, a length on the order of 100 times greater than the diameter thereof, and a packing density between 1-25%. Suitable materials for the fiber wires are platinum, gold, silver, copper, palladium, or niobium which may be embedded in a copper, silver, or other suitable matrix material, or copper embedded in an aluminum matrix. The fiber wires may be provided with a coating of a suitable barrier material on the lateral surfaces thereof as may be required to protect the fiber wires from etching during removal of the matrix material, or to prevent and/or retard interdiffusion between the matrix material and the fiber wire material during annealing or hot-forming of brush stock, and/or to impart improved electrical performance to the resultant electrical brush. The electrical brush is fabricated typically by drawing, cutting, bundling and redrawing metal fiber wires, with or without a coating or casing of a barrier material, packed in a tube of matrix material, whereupon after shaping of the multi-filamentary ends to the shape of an object to which the brush is to make contact, the matrix is etched away to a predetermined length, preferably under high centrifugal forces in a centrifuge and/or with the application of ultrasound.

33 Claims, 13 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 9

[Full](#) | [Title](#) | [Claims](#) | [Front](#) | [Review](#) | [Classification](#) | [Date](#) | [References](#) | [Sequence](#) | [Attachments](#) | [XREF](#) | [Drawings](#) | [Image](#)

21. Document ID: US 4358699 A

L1: Entry 21 of 24

File: USPT

Nov 9, 1982

US-PAT-NO: 4358699

DOCUMENT-IDENTIFIER: US 4358699 A

✓

TITLE: Versatile electrical fiber brush and method of making

DATE-ISSUED: November 9, 1982

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wilsdorf, Doris	Charlottesville	VA		

US-CL-CURRENT: 310/251; 428/611

ABSTRACT:

A versatile electrical fiber brush comprising the following components: Firstly a brush body, which is not necessarily equiaxed, non-porous, rigid or all in one piece, made of a matrix material, not necessarily electrically conductive, embedded in which is at least one set of similarly formed fibers, in which there may be embedded other, thinner fibers, and in these fibers still thinner fibers. Secondly, at least one fibrous part which is formed by removing from a part of the brush body most or all of the matrix material plus, as the conditions may make it advisable, some fibrous material. Third, at least one working surface, this being the macroscopic surface of a brush where it makes contact with the object(s) to which electrical connection shall be made. Fourth at least one set of electrically conductive fiber wires which form at least part of the working surface as well as of the fibrous part. The mechanical resilience and compliance of the fibrous parts is controlled by a system of secondary and tertiary fibers, these being generated from the embedment of fibers in fibers in the body of the brush. The electrical properties of the brush are controlled by the fiber wires. By making extremely large numbers of fiber wires of very small diameters to contact the object at the working surface of a brush, quantum-mechanical tunneling is expected to become the predominant mechanism of current conduction, yielding extremely good brush performance, while at same time brush wear is forecast to be very low.

100 Claims, 28 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 9

[Full](#) | [Title](#) | [Claims](#) | [First](#) | [Previous](#) | [Classification](#) | [Date](#) | [References](#) | [Sequence](#) | [Attachments](#)[Image](#) | [Drawings](#) | [Image](#) 22. Document ID: US 3821024 A

L1: Entry 22 of 24

File: USPT

Jun 28, 1974

US-PAT-NO: 3821024

DOCUMENT-IDENTIFIER: US 3821024 A

✓

TITLE: TEXT NOT AVAILABLE

DATE-ISSUED: June 28, 1974

US-CL-CURRENT: 428/634; 310/252, 428/366, 428/367, 428/378, 428/645, 428/656,
428/673, 428/680, 428/686, 428/929

[Full](#) [Title](#) [Citation](#) [Front](#) [Review](#) [Classification](#) [Date](#) [Reference](#) [Sequences](#) [Attachments](#)[XREF](#) [Drawn Desc](#) [Image](#)**23. Document ID: US 3818588 A**

L1: Entry 23 of 24

File: USPT

Jun 25, 1974

US-PAT-NO: 3818588

DOCUMENT-IDENTIFIER: US 3818588 A

TITLE: ELECTRICAL BRUSHES

DATE-ISSUED: June 25, 1974

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Bates, James John	Shrivenham			EN

US-CL-CURRENT: 29/826; 29/419.1, 419/11, 419/35, 419/48

ABSTRACT:

An electrical brush is constructed by moulding an aligned array of metal coated carbon fibres into a block. The block may be several times the required length and width of a brush, in which case it is then cut into strips corresponding to the desired length of a brush. The coating is then removed for part only of the lengths of the brushes to expose the individual carbon fibres at one end but leaving them consolidated for connection to a conductor at the other end. The strips are finally cut up to form individual brushes.

9 Claims, 0 Drawing figures

[Full](#) [Title](#) [Citation](#) [Front](#) [Review](#) [Classification](#) [Date](#) [Reference](#) [Sequences](#) [Attachments](#)[XREF](#) [Drawn Desc](#) [Image](#)**24. Document ID: US 3668451 A**

L1: Entry 24 of 24

File: USPT

Jun 6, 1972

US-PAT-NO: 3668451

DOCUMENT-IDENTIFIER: US 3668451 A

TITLE: ELECTRICAL BRUSH STRUCTURE

DATE-ISSUED: June 6, 1972

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
McNab, Ian Roderick	Fossway, Newcastle upon Tyne, 6			EN

US-CL-CURRENT: 310/248; 310/251

ABSTRACT:

A current transfer brush for an electrical machine consists of refractory fibers, such as aluminum oxide fibers, with a deposited metallic film. The fibers provide

mechanical strength with flexibility while the metallic films carry the current and high current densities can be achieved with low wear rates for the brushes and the contact surface which they traverse.

6 Claims, 2 Drawing figures Number of Drawing Sheets: 1

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3668451S	0
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3821024S	0
"4358699"[USPT]	1
4358699S	0
"4415635"[USPT]	1
4415635S	0
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